

Aquifer Storage and Recovery in Washington State

This information was prepared by Pacific Groundwater Group as a courtesy to the State of Montana's Water Policy Interim Committee for their meeting to be held on September 13, 2007, at Thompson Falls, Montana. It is intended to be a general summary of the topic of aquifer storage and recovery in Washington State, at this time.

The following includes information posted on the Washington Department of Ecology's website for Aquifer Storage and Recovery and from the Water Quality Permit Writer's Manual.

Aquifer Storage and Recovery (ASR) involves injecting water into an aquifer through wells or by surface spreading and infiltration and then pumping it out when needed. The aquifer essentially functions as a water bank. Deposits are made in times of surplus, typically during the rainy season, and withdrawals occur when available water falls short of demand. The storage water may also be used to enhance baseflow discharge of groundwater to streams and lakes.

Aquifer Storage Recovery Rule

Background

During 2000, the Washington State Legislature passed Engrossed Second Substitute House Bill 2867, which expanded the definition of "reservoir" in Revised Code of Washington (RCW) 90.03.370. Reservoir permits may now include, "any naturally occurring underground geological formation where water is collected and stored for subsequent use as part of an underground artificial storage and recovery project." This law set the stage for ASR permits and allows the Dept. of Ecology to issue reservoir permits to authorize the projects. Previously, reservoir permits were used only for surface water impoundment projects.

The rule that followed, Chapter 173-157 Washington Administrative Code (WAC), establishes standards for review of ASR proposals and mitigation of any adverse effects on senior water rights and the environment in the following aspects:

- Aquifer vulnerability to contamination
- Hydraulic continuity between surface water and groundwater
- Potential impairment of senior water rights
- Geotechnical impacts
- Aquifer boundaries and characteristics
- Chemical compatibility of surface and ground waters
- Recharge and recovery treatment requirements
- System operation
- Water rights and ownership of water stored for recovery

- Environmental impacts

ASR Benefits Recognized by Washington

Washington State recognizes the following potential benefits of ASR:

- Substantial amounts of water can be stored deep underground, in some areas. This may reduce the need to construct large and expensive surface reservoirs.
- ASR systems are likely to be more environmentally friendly than surface reservoirs. They also offer more protection from tampering.
- ASR may restore and expand the function of an aquifer that has experienced long-term declines in water levels due to heavy pumping necessary to meet growing urban and agricultural water needs.

ASR Application Process in Washington

In the 2002 legislative session, Engrossed House Bill 2993 simplified the application process for an ASR project by specifying that Ecology "may accept for processing a single application form covering both a proposed reservoir and a proposed secondary permit or permits for use of water from that reservoir." However, the information needed to apply for a permit is quite extensive and include:

- Conceptual hydrogeologic model (description)
- Operations plan
- Legal framework
- Environmental assessment
- Mitigation plan
- Monitoring plan

Following are the basic steps involved in permitting an ASR project:

1. Prior to applying, assess potential issues and impacts to the hydrogeologic system and the environment.
2. Schedule a pre-application meeting with Dept of Ecology to discuss the project plan and likely requirements for monitoring and mitigation.
3. Submit an application for an ASR project that contains at a minimum:
 - a. Water rights for the source waters for the proposed ASR project.
 - b. A general description of the physical design of the hydrogeologic system prepared by an engineer or geologist registered in the state of Washington.
 - c. A general description of the operational design of the hydrogeologic system prepared by an engineer or geologist registered in the state of Washington.
 - d. A project plan.
 - e. A data monitoring plan.

- f. An environmental assessment and analysis of potential adverse conditions or potential impacts to the surrounding environment, limited to storage and subsequent use of stored water that might result from the project.

Water Quality and Well Construction Rules for ASR

Washington's water quality and well construction laws and rules that come into play for ASR are quite comprehensive and complex.

Injection wells for an ASR project must be registered with Dept. of Ecology in accordance with both the provisions of Chapter 90.48 RCW - Water Pollution Control Act, and Chapter 173-218 WAC - Underground Injection Control Program (UIC).

The construction and technical aspects of ASR injection wells must abide by Chapter 173-160 WAC, the well drilling regulations.

Water to be stored in an aquifer for an ASR project must meet water quality standards for ground waters of the state of Washington (Chapter 173-200 WAC). The antidegradation policy and general groundwater quality criteria are reproduced in the Addendum section at the end of this document. Basically, if the groundwater is already of drinking water quality, you must preserve that level of quality.

Generally, there is no distinction for different water sources for ASR, such as stormwater, rivers, irrigation and drainage canals, and reservoirs. However there is a special rule for reclaimed water. The Washington State Legislature passed the Reclaimed Water Use Act (Chapter 90.46 RCW) in 1992. This law promotes the beneficial use of a new water supply derived from highly treated wastewaters. Categories include reclaimed water, greywater, and two types of industrial process water reuse. Permits are issued to the owner of the facility generating the reclaimed water and govern the water quality, distribution, and use of the water supply.

Reclaimed Water Act permits are much broader than State or NPDES wastewater discharge permits. The law requires a single comprehensive permit integrating Ecology Water Quality Program, Water Resource Program, and Department of Health requirements. Agencies and programs must coordinate as early in the process as possible. For most projects, Ecology's Water Quality Program issues the permit and includes all requirements. The state Department of Health may issue the permit for projects with only commercial and industrial uses. A reclaimed water permit grants an exclusive right to the use and distribution of the water and has stringent requirements for treatment reliability and disinfection.

Current ASR Projects in Washington

- Eastern Washington projects:
 - City of Yakima – inject surface water during higher flow periods to recharge deep confined aquifers in basalt rock to mitigate declining storage
 - City of Walla Walla – inject surface water from reservoir to mitigate streamflow effects of pumping from shallow aquifer.
 - Palouse River Watershed – search for suitable areas to recharge winter streamflow to mitigate severe groundwater level declines
 - Foster-Moses Coulee Watershed – search for suitable areas to recharge winter streamflow to mitigate low streamflow
 - Stateline Project, Whitman County – inject reclaimed water to mitigate effects of pumping from shallow aquifer for a commercial mall development

- Western Washington projects:
 - Lakehaven Utility District, King County – inject surface water from a reservoir to increase groundwater supply
 - Nooksack Watershed, Whatcom County – inject surface during higher flow periods to increase lowflow during summer
 - City of Yelm – inject reclaimed water to increase groundwater supply
 - Lacey-Olympia-Tumwater-Thurston County (LOTT) Partnership – inject reclaimed water to increase groundwater supplies in the three cities and nearby parts of the County.

Other ASR projects are likely in progress.

Addendum – Excerpt from Washington’s Groundwater Quality Rules

Following is the antidegradation policy that is part of the groundwater quality rules.

WAC 173–200–030 Antidegradation policy.

(1) The antidegradation policy of the state of Washington, is generally guided by chapter 90.48 RCW, the Water Pollution Control Act, and chapter 90.54 RCW, the Water Resources Act of 1971. The goal of this policy is to ensure the purity of the state’s ground waters and to protect the natural environment.

(2) The antidegradation policy is as follows:

(a) Existing and future beneficial uses shall be maintained and protected and degradation of ground water quality that would interfere with or become injurious to beneficial uses shall not be allowed.

(b) Degradation shall not be allowed of high quality ground waters constituting an outstanding national or state resource, such as waters of national and state parks and wildlife refuges, and waters of exceptional recreational or ecological significance.

(c) Whenever ground waters are of a higher quality than the criteria assigned for said waters, the existing water quality shall be protected, and contaminants that will reduce the existing quality thereof shall not be allowed to enter such waters, except in those instances where it can be demonstrated to the department’s satisfaction that:

(i) An overriding consideration of the public interest will be served; and

(ii) All contaminants proposed for entry into said ground waters shall be provided with all known, available, and reasonable methods of prevention, control, and treatment prior to entry.

The groundwater quality criteria are described in the following (I have not included a table listing all the water quality parameter limits).

WAC 173–200–040 Criteria.

(1) Ground waters in the state of Washington support many different beneficial uses. The purpose of these criteria is to establish maximum contaminant concentrations for the protection of a variety of beneficial uses of Washington's ground water.

(a) Drinking water is the beneficial use generally requiring the highest quality of ground water.

(b) Providing protection to the level of drinking water standards will protect a great variety of existing and future beneficial uses.

(c) Some ground waters of the state support environmental systems with existing and future beneficial uses requiring more stringent protection than that provided by human health based criteria. These ground waters and dependent uses will be protected by either or both of the following:

(i) Designation of an area and its associated ground water as a special protection area in accordance with WAC 173–200–090.

(ii) Establishment of enforcement limits as close to the natural ground water quality as possible for activities that may adversely affect those ground waters in accordance with WAC 173–200–050.

(d) The use of criteria based on drinking water quality shall in no way be interpreted to mean that all ground waters are used for drinking water or that all ground waters are presently suitable for drinking water.

(2) The following criteria shall apply to all ground waters in the state of Washington:

(a) Ground water concentrations shall not exceed the criteria listed in Table 1, except as described in WAC 173–200–050 (3)(b).

(b) For the primary and secondary contaminants and radionuclides listed in Table 1, the criteria shall be the most stringent concentration of the following and those listed in Table 1:

(i) Maximum contaminant level goals;

(ii) Maximum contaminant levels; and

(iii) State maximum contaminant levels published in chapter 248–54 WAC as presently promulgated or subsequently amended or repromulgated.

The criteria for primary and secondary contaminants and radionuclide contaminants in Table 1 shall be amended as the federal and state rules are amended and without amendment of this chapter.

(c) For carcinogens listed in Table 1, the criteria are the concentrations that are anticipated to result in a total incremental human cancer risk of less than 1 in 1,000,000, and were estimated using the following equation and standard exposure assumptions:

For volatile carcinogens, inhalation exposure from showering was incorporated into the criteria by doubling the drinking water ingestion rate.

(3) For contaminants for which no numeric criteria have been established, enforcement limits shall be established in accordance with WAC 173–200–050.